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Note on the importance of the Spectroscopical Examination of the Vicinity of the Sun when totally eclipsed, for the determination of the nature and extent of its Luminous Atmosphere, and on the partial identity of that Atmosphere with the Zodiacal Light. By Professor E. W. Brayley, F.R.S., F R.A.S.

Many facts conspire to prove that a faintly luminous atmosphere of great, but variable extent, encompasses the Sun exterior to the photosphere. Sir John F.W. Herschel has shown from the deficiency of light at the borders of the Sun's visible disk, that its extent must be considerable, not merely in absolute measure, but as an aliquot part of the Sun's radius. The phenomena of the luminous prominences evince the truth of this inference, Mr. De La Rue having found that the height of the summit of one of these clouds from the edge of the disk is about 72,000 miles, which is a little less than $\frac{1}{6}$ of the Sun's radius. But the phenomena of the Corona, and especially those of the projections from it, seen so remarkably at the total eclipse of the year 1860, tend to prove that a much greater extent than this, an extent equal to many radii of the Sun, must be attributed to the solar atmosphere.

The luminosity of the clouds (which, as Mr. De La Rue has also shown, have great photographic power) evinces that they consist of incandescent globules in the liquid state, or solid particles, probably of the metals discovered in the Sun by Kirchhoff. This implies the incandescence of the atmosphere itself in which they are suspended; but as they must be composed of gaseous matter, its light is necessarily very faint, and in fact is not yet known to have been observed.

The excessively elevated temperature which we must ascribe to space immediately around the Sun, and which, according to Professors Sir William Thomson and Mr. Tait, would convert a planet into vapour if within a few hundred thousand miles of the luminary, would imply that the extent of the atmosphere is limited only by the balance between its heat and its gravity, the former of which, from all solar phenomena, appears in a high degree to exceed the latter.

And this atmosphere, even to such an extent, must be incandescent (except, perhaps, at its exterior regions), but being gaseous, its luminosity will not be proportionate to its temperature in the same ratio as would exist in the case of a solid or a liquid, and as is manifested in the intense light of the photosphere, but as just noticed must be very faint.

This, doubtless, is the reason why under all ordinary circumstances it is invisible, being overpowered by the photospheric radiation or sunshine. It is this very faintness of its luminosity, which permits the deficiency of the light of the photosphere at the borders of the Sun's disk, occasioned by the absorptive action of the atmosphere, to be observed.

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These considerations will evince the importance of the spectroscopical examination of the vicinity of the Sun when totally eclipsed, for the determination of the nature and extent of its luminous atmosphere. The researches of Kirchhoff have demonstrated, by a combination of optical and chemical evidence, that an absorptive gaseous medium surrounds the incandescent body of the Sun. It is perfectly consistent with that evidence to believe that the surface of the photosphere on which the spots burst forth, or to which their formative torrents rise, is the immediate source of the light, certain rays of which are absorbed by that medium, and so give the Frauenhofer lines. These, agreeably to the same researches, explain the chemical nature of the absorptive medium. But the gaseous, monochromatic, or bright-line spectrum, which, agreeably to our present knowledge, it must be inferred the exterior luminous atmosphere would give, is not witnessed, because it is overpowered by the continuous or ordinary solar spectrum. When, however, the photospheric radiation causing that spectrum is excluded by the eclipse, the vicinity of the Sun may be expected to yield a monochromatic spectrum, the situation of the bright lines in which will evince of what elements the exterior luminous atmosphere is composed. For reasons which I shall eventually submit to Astronomers and Spectroscopists, I venture to predict that when a suitable opportunity for the observation shall present itself, it will be found that the spectrum obtained will correspond to the spectra given by the unresolved Nebulæ, from which our Secretary, Mr. Huggins, has inferred that they do not consist of stars, but are masses of luminous gas. To this subject I shall return in the sequel.

It is most probable that the Sun's luminous atmosphere is conterminous, or rather identical in part, with the Zodiacal Light, which must thus be regarded as consisting of incandescent aeriform matter, through which take their course more luminous solid or solidifying particles — condensing bubbles of solar froth — which I have termed meteoritic masses, the particles of Cassini, and the meteors or meteoric masses of Olmsted, Biot, and Sir John Herschel.

If my views of the production of meteoritic masses by the condensation of solar aeriform matter be well founded, those of Sir John Herschel, of the planetary molecular constitution of the Zodiacal Light, will necessarily follow; but this is not incompatible with the co-existence of a gaseous solar atmosphere in which they are produced, and in and with which they continue to move. I shall hereafter endeavour to prove that the existence of a solar atmosphere of the extent and ellipticity of the Zodiacal Light is perfectly consistent with dynamical laws; the equilibrium of the solar atmosphere being however of a nature altogether different from that of the Earth's, or of any planetary atmosphere.

Of the visible structure of the Zodiacal Light, we have few

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telescopic observations. It would seem that the telescope has scarcely been applied to it since the time of the elder Cassini. The Spectroscope has not been applied to it at all. But if these views are correct, when it shall be spectroscopically examined under favourable circumstances, (which cannot perhaps, be expected to occur in these climates, always seen in part as it must be through the least transparent strata of our atmosphere) the Zodiacal Light should yield a monochromatic spectrum, with bright lines making known the chemical composition of its gaseous portion. Some of the meteoritic masses which traverse it may very probably be themselves in a denser gaseous state, like the nucleus of a Comet, others will have become liquid or solid, and the collective glare of all these particles may be expected to give a faint continuous spectrum in addition.

It would be disingenuous in me, on account of several remarks which I have offered in the course of this Note, were I now to omit the announcement of my having arrived at the conclusion, that in all probability the bright-line or monochromatic spectra, from which Mr. Huggins has inferred the gaseous constitution of certain Nebulæ, are due in reality to the luminous atmospheres of their constituent Stars or Suns. I am about to submit to the Royal Society a paper in which the grounds of that conclusion will be stated.

London Institution, June 14th, 1867.

On the connexion between Comets and Meteors.

By G. Johnstone Stoney, M.A., F.R.S.

The astonishing fact which Sig. Schiaparelli brought to light some months ago, that there are comets moving in the tracks of the August and November meteors, compels us to infer that there is some intimate physical connexion between the two. In January last, M. Leverrier pointed out that such stream of meteors must have been in compact clusters when they underwent the great perturbations which brought them into permanent connexion with the Solar System. And Mr. Graham has lately shown that the meteoric iron which reaches our Earth had been at some previous time red-hot; and that when last red-hot it was acted on by hydrogen under considerable pressure—a pressure of perhaps six or more atmospheres. It is my present design to make use of these inferences as data,

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